# Proposed Plan (Final)

## *Operable Unit 15*

## *Beacon Beach Skeet Range (FR038)*

## Tyndall Air Force Base

## Panama City, Florida

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| ***Public Meeting:*** | **September 5, 2018**<br>**5:30 p.m.** |
| *The U.S. AF, the U.S. EPA, and the FDEP invite the public's review concerning Remedial Alternatives for FR038. The Date and Time of the Public Meeting will be announced in the Panama City News Herald.* | |
| ***Public Meeting Location*** | |
| ***Parker Community Center,***<br>*935 West Park Street, Parker, Florida 32404* | |
| ***Administrative Record File Locations*** | |
| ***Tyndall AFB Library***<br>*640 Suwanee Road*<br>*Tyndall AFB, Florida 32403*<br><br>*Hours: Sunday and Monday closed; Tuesday through Saturday, 10:00 a.m. to 6:00 p.m.* | ***Bay County Public Library***<br>*898 West 11th Street*<br>*Panama City, Florida 32401*<br><br>*Telephone: 850.872.7500*<br><br>*Hours: Monday through Wednesday, 9:00 a.m. to 8:00 p.m.; Thursday through Saturday, 9:00 a.m. to 5:00 p.m.; Sunday, 1:00 p.m. to 5:00 p.m.* |
| *The U.S. AF will accept comments on this Proposed Plan during a 30-day public comment period. Public comments can be provided orally during the public meeting. Written comments can be provided by letter, fax, or e-mail to the contact listed below:*<br>**Mr. Joseph McLernan, Remedial Project Manager**<br>**AFCEC/CZO, Bldg 421, Stop 42, 119 Alabama Avenue**<br>**Tyndall AFB, Florida 32403-5014**<br>*Phone: 850.283.4430 Fax: 850.283.3854*<br>*e-mail:* joseph.mclernan@us.af.mil | |

## 1. Introduction

The United States Air Force (U.S. AF) is conducting cleanup activities at Tyndall Air Force Base (AFB) to address contamination resulting from past range operations at the base. As part of these cleanup activities, the U.S. AF, the United States Environmental Protection Agency (U.S. EPA), and Florida Department of Environmental Protection (FDEP) request public review and comment on this Proposed Plan for Operable Unit 15, the former Beacon Beach Skeet Range (FR038). This Proposed Plan was developed consistent with the Tyndall AFB Federal Facility Agreement and is being issued to facilitate public involvement in the remedy selection process for the remedial approach being considered for FR038. **Figure 1** provides an overview of Tyndall AFB and shows the location of FR038. This Proposed Plan presents the Preferred

Alternative for cleaning up soil impacted by historical skeet range operations at FR038 and discusses the remedial alternatives considered as part of the 2017 FR038 Remedial Investigation/Focused Feasibility Study (RI/FFS).

This Proposed Plan is issued to solicit public comments on all of the remedial alternatives, particularly the Preferred Alternative proposed for FR038. It is intended to inform the public that a Preferred Alternative has been identified from among all the alternatives considered in the RI/FFS and to provide the public with the rationale used to support that preference. The RI/FFS summarizes the conditions at the former range and also presents data gathered at FR038 during RI field work conducted in 2008 and 2012, an engineering evaluation/cost analysis (EE/CA) prepared in 2013, and a subsequent non-time-critical removal action (NTCRA) conducted in 2015. The data from the 2008 and 2012 RIs were used to conduct risk assessments in the 2017 RI/FFS for potential human health and ecological risks. A glossary list of acronyms is provided at the back of this document.

This Proposed Plan is issued as part of the U.S. AF's public participation requirements as mandated under §117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA [or Superfund]), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) §300.430(f)(3).

The U.S. AF prepared and made available this Proposed Plan with the concurrence of the U.S. EPA (the lead regulatory agency for site activities) and the FDEP (the support agency for site activities). This Proposed Plan will become part of the administrative record file for Tyndall AFB in accordance with the NCP §300.825(a)(2). The U.S. AF and the U.S. EPA will select a remedy for the FR038 soil impacted by historical range operations in a record of decision (ROD), with input from the FDEP, after information received during the public comment period has been reviewed and considered. New information or arguments the lead agency learns during the public comment period could result in the selection of a final remedial action that differs from the Preferred Alternative.

The public is encouraged to review this Proposed Plan and other supporting documents maintained in the administrative record file at the Bay County and Tyndall AFB libraries.

## 2. Site Background

Tyndall AFB is located approximately 12 miles southeast of the center of Panama City, in the northwestern panhandle of Florida. It occupies an 18-mile-long peninsula extending into the Gulf of Mexico and trending northwest-to-southeast (see **Figure 1**). Tyndall AFB was activated on December 7, 1941 at the outset of World War II to train instructors for a gunnery school. It is currently an active U.S. AF installation (or base) with a variety of missions, all tied directly with combat readiness training for the Air Combat Command.

FR038 is a 74-acre site located in the northwestern portion of Tyndall AFB (see **Figure 2**). Historically, FR038 consisted of 16 shotgun skeet ranges used to train Army Air Corps gunners, reportedly from 1943 to pre-1964. The primary chemical constituents associated with skeet ranges are lead from lead shot and polycyclic aromatic hydrocarbons (PAHs), which are contained in the coal tar pitch binding agent of the clay targets historically used at skeet ranges.

Lead shot can provide a source of lead to surrounding soil by oxidation of lead on the pellet surface under moist conditions. Clay targets are brittle, breaking easily in response to being hit by lead shot. The brittle target fragments provide a source of PAHs to surrounding soil by the mechanical breakdown of fragments into smaller and smaller particles until ultimately becoming part of the soil matrix.

Since the closure of the range sometime prior to 1964, proposed redevelopment projects at FR038 (including the development of the First Air Force Headquarters [AFHQ] Complex) prompted environmental investigations and remedial actions, as required under CERCLA and the NCP, to confirm or deny contamination from historical use and to determine future cleanup actions.

## 3. Summary of Investigations, Interim Removal Action, and Remedial Alternatives

Several environmental investigations were conducted at FR038 between 2005 and 2012 to identify the presence of lead shot and clay target fragments, and to delineate constituent concentrations in soil, groundwater, surface water, sediment, and stormwater (i.e., rain water diverted to an enclosed drainage swale) that may have resulted from historical use of the site. These investigations included a preliminary assessment (PA) and a site inspection (SI) conducted in 2005-2006 and RI field activities completed in 2008 and 2012.

In 2005, the proposed construction of the First AFHQ Complex in the western portion of FR038 required the completion of a PA/SI, which focused primarily on the construction area of the complex. Surface soil, subsurface soil, and groundwater samples were collected and analyzed for lead and/or PAHs. Sample location bias was toward the proposed building footprint in areas of suspected highest contamination, and in background locations for potential low-level analyte comparison. The PA/SI was completed in early 2006, and the report concluded that lead and PAH compounds were present at FR038 at concentrations above Florida Soil Cleanup Target Levels (CTLs).

In February 2008, an RI field investigation was completed to characterize FR038 for development and evaluation of remedial alternatives. Soil, groundwater, surface water, sediment, and biota (plant tissue) samples were collected and analyzed based on historical use for PAHs, lead, antimony, arsenic, copper, tin, and zinc.

Additional data were collected in 2012 to determine the nature and extent of site-related contaminants in the environment. Soil, groundwater, surface water, and sediment samples were collected at FR038 and analyzed for PAHs and select metals, including metals typically associated with munitions (i.e., antimony, arsenic, copper, lead, and zinc).

Data collected during the 2012 RI included the mass of residual lead shot and visible target fragments in soil samples. Data on the distribution of lead shot in soil revealed a poor correlation between the presence of lead shot in soil and the concentration of lead in soil. Site characterization data revealed that, in the dry upland sands associated with 90 percent of FR038, limited oxidation and dissolution of lead has occurred, limiting the amount of lead loaded onto site soil. Remedial goal options (RGOs) for soil at FR038, therefore, are focused on reducing the mass of lead associated with shot pellets in soil, as well as reducing lead in soil. Elevated concentrations of PAHs in soil are associated with visible target fragments consistent with mechanical weathering of the target fragments as the source of PAHs in soil.

An EE/CA was completed in 2013 to document the 2012 field investigation activities and determine if an NTCRA was necessary at specific areas of FR038 designated for development. The Development Areas, locations of proposed or existing construction projects within FR038, include:

- Development Area A: parking lot, 1.43 acres, north of the First AFHQ Complex
- Development Area B: parking lot, 0.45 acre, northwest of the First AFHQ Complex (removal action partially completed during 2013, but additional removal areas were identified based on exceedances of cleanup values established in the EE/CA Report)


**Legend**

- Installation Boundary
- FR038, Beacon Beach Skeet Range

N

0 2 4

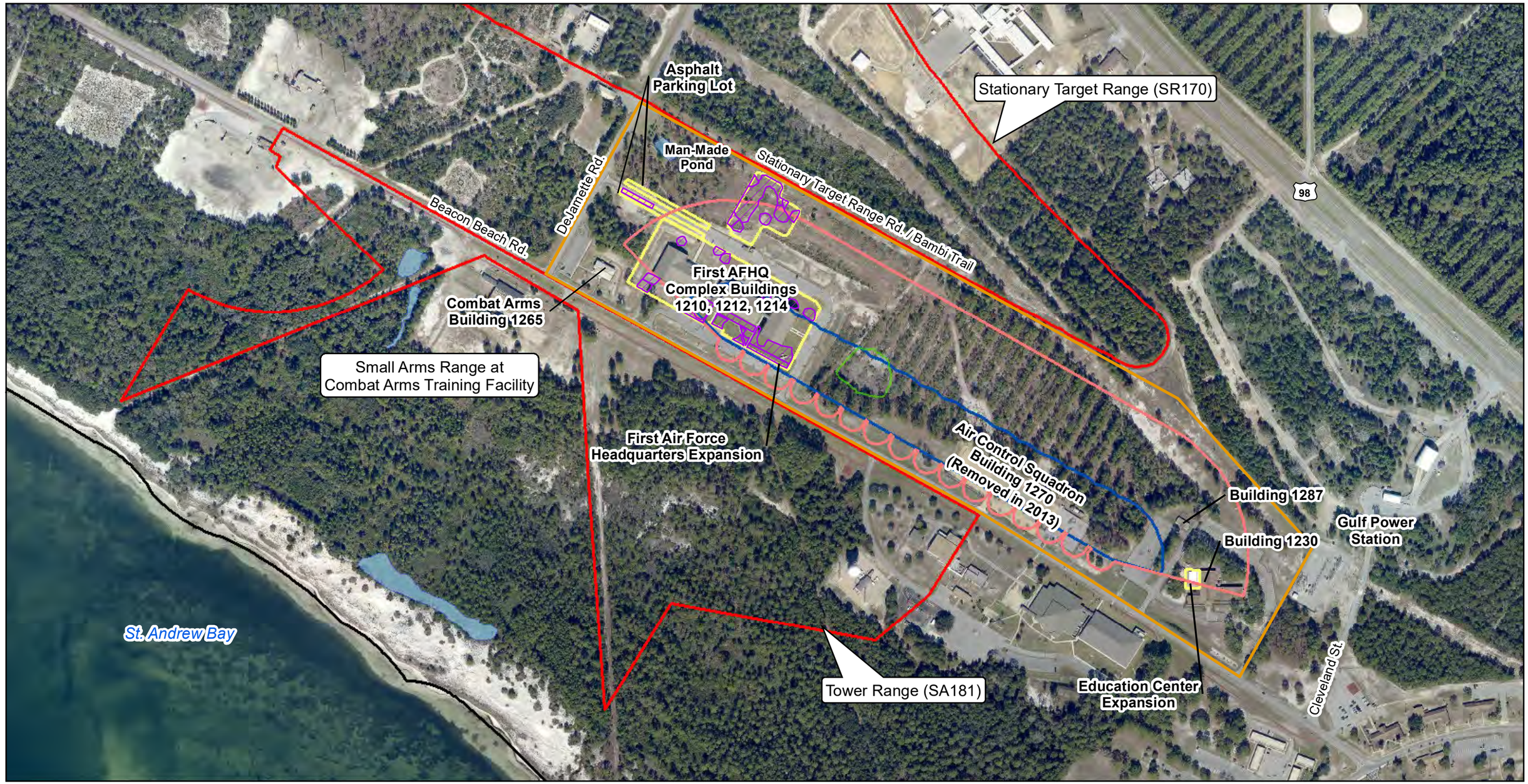
Miles

TYNDALL AIR FORCE BASE
FLORIDA

**Site Location Map**
**Beacon Beach Skeet Range (FR038)**

ARCADIS

FIGURE
**1**




**Legend**

- Installation Boundary
- Beacon Beach Skeet Range (FR038)
- 2015 NTCRA Footprint
- Theoretical Shot Accumulation Zone
- Theoretical Clay Target Accumulation Zone
- Historical Firing Ranges
- Development Area
- Buildings and Parking Areas
- Ephemeral Wetland
- Surface Water

**Notes:**
- AFHQ - Air Force Headquarters.
- NTCRA - Non-Time Critical Removal Action.
- Source: Aerial - 2013 Bay County Florida GIS Department.

N

0 250 500

Feet

TYNDALL AIR FORCE BASE
FLORIDA

**Site Map**
**Beacon Beach Skeet Range (FR038)**

ARCADIS

FIGURE
**2**

- Development Area C: expansion of the Education Center (Building 1230) (completed in 2013 and not part of the scope of the NTCRA)
- Development Area D: expansion of subsurface/surface infrastructure within the 25-meter security buffer around the First AFHQ Complex.

The EE/CA determined that removal actions were appropriate in Development Areas A, B, and D, but not necessary within Development Area C because contamination levels were below risk-based concentrations for industrial land use. Remedial Action Objectives (RAOs) were developed to evaluate the effectiveness, implementability, and cost of potential removal action alternatives that could be used for the remediation of lead shot, clay target fragments, and contaminated soil within these areas. The EE/CA Report evaluated several removal action options applicable to Development Areas A, B, and D. Alternatives included:

- Alternative 1: No Action/Land Use Controls (LUCs).
- Alternative 2: LUCs and soil removal and disposal from areas with soil concentrations exceeding the U.S. EPA Industrial Regional Screening Levels (RSLs) or Florida Soil CTLs.
- Alternative 3: LUCs and soil removal and disposal from areas with soil concentrations exceeding the U.S. EPA Residential RSLs or Florida Soil CTLs.

Based on a comprehensive assessment and comparison of the three NTCRA alternatives, Alternative 2 was recommended for the designated Development Areas.

Based on the results of the 2013 EE/CA, an NTCRA was completed in 2015 in the portions of Development Areas A, B, and D where contaminant levels exceeded cleanup values established in the EE/CA Report. During the NTCRA, 10,106 tons (approximately 8,050 cubic yards [CY]) of non-hazardous soil was excavated and disposed off site. This included 546 tons of lead-impacted soil that was chemically stabilized to allow disposal of the soil in a Resource Conservation and Recovery Act of 1976 (RCRA) Subtitle D Landfill. The excavation was backfilled with clean fill material, covered with 6 inches of topsoil, and overlain with sod.

***Data Summary***

Field investigations conducted at FR038 from 2005 to 2012 identified the presence of lead shot and clay target fragments in surface and subsurface soil, as well as concentrations in soil, groundwater, surface water, sediment, and stormwater of constituents that may have resulted from the historical use of FR038. Results of these investigations are sufficient to identify the constituents of potential concern (COPCs) and constituents of potential ecological concern (COPECs), delineate their nature and extent, complete a human health risk assessment (HHRA) and ecological risk assessment (ERA), and develop appropriate remedial measures. Data collected were used to prepare the FR038 RI/FFS. **Table 1** presents a summary of the sampling media and findings used to define the nature and extent of contaminants at FR038.

***Constituents of Potential Concern***

COPCs for FR038 were identified in the RI/FFS and used to perform an HHRA to evaluate potential risk to human health. COPCs identified in soil include antimony, arsenic, lead, and PAHs (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz[a,h]anthracene, fluoranthene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, and pyrene; **Table 2**). The direct exposure of site workers and construction workers to carcinogenic PAHs, arsenic, antimony, and lead in surface soil comprises the majority of the existing site cancer risk and non-cancer hazards. Although FR038 is used for industrial purposes, an evaluation of hypothetical future residents was performed to

evaluate the feasibility of unrestricted closure or the need for a LUC.

Groundwater COPCs included antimony, arsenic, and lead. Concentrations of arsenic and antimony above their respective U.S. EPA RSLs were observed in groundwater samples from monitoring wells located either upgradient from or adjacent to FR038. However, only lead can be associated with historical activities at FR038. An evaluation of groundwater was performed for site worker exposure and future hypothetical residents.

COPCs in soil and groundwater were treated as site-wide contaminants, while sediments and surface water were limited to the, hydrologically isolated, 0.16-acre pond located in the northwest corner of the site. The pond is small and isolated, and no significant risk to human health was anticipated from COPCs in sediment and surface water based on the low levels of carcinogenic PAHs in sediment, and low levels of lead in surface water. Therefore, sediment and surface water were not carried through the risk assessment. Stormwater is present on site following precipitation events consistent with an acute exposure scenario. Concentrations of constituents in stormwater were below acute water quality criteria; therefore, the stormwater pathway was not retained for further evaluation.

***Constituents of Potential Ecological Concern***

COPECs were identified in the RI/FFS and used to perform an ERA to evaluate potential risk to the environment. Soil COPECs include PAHs and metals and are summarized in **Table 2**. No pathway exists for groundwater to ecological receptors; therefore, groundwater COPECs were not identified. COPECs were not carried into the ERA for sediments, surface water, or stormwater.

Few COPECs exceeded their respective screening levels in the surface water and sediment, and the water body is small and isolated from any surrounding habitats. Consequently, the surface water and sediment exposures do not pose a risk to ecological receptor populations. Although chronic surface water criteria have been exceeded, maximum concentrations of COPECs in stormwater samples were below their respective acute surface water screening criteria, which represent a more appropriate potential exposure to COPECs in stormwater.

***Lead Shot and Target Fragments***

Residual lead shot and clay target fragments can provide a future source of lead and PAHs to soil from chemical and mechanical degradation. Because the lead shot at FR038 has been in the soil since the 1940s, degradation of shot pellets over the past 70 years was evaluated to characterize degradation of pellets and lead loading to soil. Future loading of lead to soil from residual lead shot was demonstrated to be protective of human health.

Birds can potentially ingest lead shot from soil to use as grit, aiding digestion of hard food items such as seeds. The remediation goal for lead shot in soil was demonstrated to be protective of birds potentially ingesting shot pellets as grit.

Finally, the mass of residual target fragments in soil was evaluated based on the chemical composition of coal tar pitch and the proportion of coal tar pitch in target formulations. Using this approach, residual target fragments were compared to toxicity criteria for PAHs.

***Remedial Action Alternatives***

Remediation to unlimited use and unrestricted exposure was initially considered for the site but eliminated as an alternative based on the existing facilities, mission disruptions, and cost. The area use is currently commercial/industrial and land use institutional controls will be used in the selected remedy. Because of the potential risk from direct exposure to soil, remedial goal options (RGOs) were developed to be protective of commercial/industrial worker exposure to soil. The risks from exposure to groundwater, surface water, sediment, and stormwater were acceptable for human and ecological receptors; therefore, no groundwater, surface water, sediment, or stormwater RGOs were developed.

**Table 1**
**Nature and Extent of Contaminants at FR038**

| Environmental Media | Findings of Historical Investigations |
|---|---|
| Lead Shot and Clay Target Fragment Delineation | • The highest occurrence of lead shot on the ground surface was reported in the ephemeral wetland and northeast of the First AFHQ Complex (2012 RI Field Investigation).<br>• The highest occurrence of clay target fragments was northeast of the First AFHQ Complex and transects along the northern and southern boundaries of the site (2012 RI Field Investigation).<br>• Poor correlation of high densities of lead shot and concentrations of lead in soil in dry upland soil due to lower rates of oxidation and dissolution of lead on the surface of pellets and then loading on to surrounding soils.<br>• The greatest degradation of lead shot and relative loading (adsorption) of lead to soil has occurred in the ephemeral wetland in the presence of greater soil moisture.<br>• Approximately 98 percent (%) of the lead mass and approximately 86% of the clay target fragment mass identified in samples are within the top 1 foot of soil. |
| Soil | • The highest PAH concentrations in soils were detected along the southern boundary of the site (2008 and 2012 RI Field Investigations).<br>• Metals were detected in soils across the site; however, only three (antimony, arsenic, lead) exceeded industrial screening criteria with the majority of exceedances in the top 1 foot of soil (2008 and 2012 RI Field Investigations). |
| Groundwater | • Only one PAH (naphthalene) in one groundwater sample exceeded tap water screening criteria and very few other PAHs were detected, thus not presenting significant concern for groundwater (2005 PA/SI, 2008 and 2012 RI Investigations).<br>• Metals in groundwater exceeding the U.S. EPA maximum contaminant levels (MCLs) included antimony, arsenic, and lead (2005 PA/SI, 2008 and 2012 RI Investigations).<br>• Concentration gradients were not apparent, indicating that there are no contaminant plumes present in groundwater. |
| Surface Water | • PAHs were not detected in surface water, but lead exceeded surface water screening criteria in the three surface water samples analyzed (2008 and 2012 RI Field Investigations). |
| Sediment | • Four carcinogenic PAHs and arsenic exceeded residential screening criteria in sediment. Carcinogenic PAHs were converted to a benzo(a)pyrene toxic equivalent concentration (BaP TEQ), which slightly exceeded industrial screening criteria (2008 and 2012 RI Field Investigations). |
| Stormwater | • PAHs were detected in one sample, and the BaP TEQ exceeded chronic surface water criteria (2012 RI Field Investigation).<br>• Lead and arsenic exceeded chronic surface water screening criteria (2012 RI Field Investigation). |

**Table 2**
**Soil COPCs and COPECs Identified in the Screening Process**

| Analytes | Human Health-based COPCs | Ecological-based COPECs |
|---|---|---|
| Metals | Antimony<br>Arsenic<br>Lead | Antimony<br>Arsenic<br>Copper<br>Lead<br>Tin<br>Zinc |
| Non-Carcinogenic PAHs | Benzo(g,h,i)perylene<br>Flouranthene<br>Naphthalene<br>Phenanthrene<br>Pyrene | Anthracene<br>Benzo(g,h,i)perylene<br>Fluoranthene<br>Phenanthrene<br>Pyrene |
| Carcinogenic PAHs | Benz(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Chrysene<br>Dibenz(a,h)anthracene<br>Indeno(1,2,3-cd)pyrene | Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Benzo(k)fluoranthene<br>Chrysene<br>Dibenz(a,h)anthracene<br>Indeno(1,2,3-cd)pyrene |

The RI/FFS also included the development of RAOs, an analysis of applicable or relevant and appropriate requirements (ARARs), and selection of Site-specific risk-based RGOs.

Three remedial action alternatives were considered for FR038, with two of the alternatives developed to be protective of commercial/industrial land use scenarios at FR038. The "No Additional Action" remedial alternative is included as a baseline for comparison, as required by the NCP.

- Alternative 1: No Additional Action
- Alternative 2: Surface Removal Action and LUCs to Address Industrial Worker Risk
- Alternative 3: Surface and Subsurface Removal Action to Address Industrial Worker Risk, Construction Worker Risk, and Lead Mass Removal Optimization

These alternatives are discussed in **Section 8** of this Proposed Plan. The RI/FFS evaluates the performance of each of these remedial alternatives using criteria specified by the NCP §300.430(e)(9). As a result of this evaluation, **Alternative 3: Surface and Subsurface Soil Removal Action to Address Industrial Worker Risk, Construction Worker Risk, and Lead Mass Removal Optimization**, was selected as the Preferred Alternative.

## 4. Site Characteristics

FR038 is located in the northwestern portion of Tyndall AFB, approximately 2,000 feet southwest of U.S. Highway 98 and 2,000 feet northeast of St. Andrew Bay on the Gulf of Mexico. FR038 occupies approximately 74-acres consisting primarily of planted pine forest and administrative and operations buildings. The site is bounded to the south by Beacon Beach Road, to the west by DeJarnette Road, to the north by the perimeter road (also known as Stationary Target Range Road or Bambi Trail), and to the east by the Gulf Power Substation (**Figure 2**). The buildings, parking areas, and landscaped areas are located primarily along the southern border of the site along Beacon Beach Road. The buildings include:

- First AFHQ Complex - Buildings 1214, 1210, and 1212
- Combat Arms Building - Building 1265
- Air Defense Counsel - Building 1287
- Education Center - Building 1230 (Air Force Personnel Training Center).

In 2013, the Air Control Squadron (Building 1270), formerly located along the southern site boundary, was demolished. Loose soil remains in place where the foundation was removed, and there are currently no development plans for this area.

Two historical firing ranges are located adjacent to FR038 to the north and south:

- Stationary Target Range (SR170) to the north; and
- Tower Range (SA181) to the south.

An active small arms range is located southwest of FR038 at Combat Arms Training Facility within the footprint of the historical Tower Range (SA181).

Environmental investigations have been conducted at the Gulf Power Substation, located adjacent to FR038 on the east, since 1992 for arsenic impacts in soil, groundwater, and surface water. An arsenic groundwater plume extends off the Gulf Power Substation site and impacts groundwater within FR038 where groundwater discharges to a lined stormwater drainage ditch south of Building 1230. Elevated arsenic levels in the soil, groundwater, and surface water resulted from historical application of an herbicide that contained arsenic trioxide within the fenced area of the Gulf Power Substation prior to the mid-1970s. Naturally occurring arsenic is also present in soil and groundwater.

There are approximately 1.1 acres of ephemeral wetlands in the south-central portion of FR038, southeast of the First AFHQ Complex (**Figure 2**). This area is at a topographic low and contains standing water only during periods of heavy rainfall by receiving runoff from the adjacent areas. A small 0.16-acre man-made pond is located in the northwestern corner of FR038 (**Figure 2**). This perennial pond, originally created as a fish hatchery, is hydrologically isolated within an area designated for commercial/industrial land use. The pond is currently unused and closed.

A small man-made ditch (Southeast Ditch) is located among the pine trees in the eastern area of the site (**Figure 2**). It is approximately 3 feet wide with low berms on each side that are densely vegetated with grasses, shrubs, trees, and vines. The ditch drains stormwater from the eastern side of the site and from outside the northern site boundary along the power line corridor. The ditch leads to a culvert under the parking lot at the Education Center - Building 1230.

Four shallow, un-lined stormwater retention basins are located around the northern and eastern parking lots of the First AFHQ Complex and are intermittently filled. A stormwater retention basin is also located south of the Education Center Building 1230 near Beacon Beach Road. Water in this basin is approximately 1 to 2 feet deep and is close to groundwater, which is approximately 4 feet below ground surface. The east retention basin is a lined ditch system installed by Gulf Power as part of their remedial action at the electric substation site.

The two predominant soil types at FR038 are characterized as poorly to excessively drained sand, and poorly to very poorly drained sand with organic matter common at depth.

Most native vegetation has been cleared at Tyndall AFB. Uplands with deep sandy soils were converted to slash pine commercial plantations, interspersed with sand pines. Efforts to restore the peninsula's native ecosystems are currently underway.

## 5. Scope and Role of the Response Action

As with many large Superfund sites, actions at Tyndall AFB are complex. A 2013 tri-party Federal Facility Agreement (FFA) between the U.S. AF, the U.S. EPA, and the FDEP identified over 100 historic areas located on the 29,000 acre-facility. The FFA outlines the procedural framework to address these areas. A Site Management Plan is updated at least annually to establish site lists, schedules and milestones for investigations and necessary interim or final remedial actions for these areas. Regular meetings between the U.S. AF, U.S. EPA and FDEP are held to set priorities and track progress.

FR038 was evaluated for CERCLA action as stipulated in the FFA. The Preferred Alternative presented in this Proposed Plan, and specific to Operable Unit 15, consists of excavation and off-site disposal of soil impacted by constituents of concern (COCs) at concentrations that result in unacceptable human and ecological risk. The Preferred Alternative would significantly reduce the potential for human and ecological exposure to impacted soil at the site. While the Preferred Alternative significantly reduces the probability of contact with impacted soil, some constituent concentrations will remain on site that preclude unrestricted use of the site; therefore, LUCs will be necessary to include prohibition of uncontrolled excavation.

## 6. Summary of Site Risks

FR038 was historically used as a skeet range, and associated constituents were detected during the SI and RI field activities at concentrations exceeding screening levels. The RI/FFS presents an HHRA and ERA that evaluates the potential risks from exposure to the COPCs/COPECs. COPCs/COPECs that may present potentially unacceptable risks to future receptors, both human and ecological, were identified as COCs for this site, and site-specific risk-based RGOs were calculated as part of the risk assessment.

Lead, arsenic, antimony, and carcinogenic PAHs were identified as the COCs in site soils. Based on the results of the risk assessment, direct contact with soil was determined to be the driving exposure pathway for site workers, construction workers, recreational users, and potential future residents. Ingestion of antimony, arsenic, lead, and high molecular weight PAHs (HPAHs) by small mammals and birds in soil and through the food chain is the driving risk factor for ecological receptors.

It should be noted that during preparation of this PP, inconsistencies were identified in the RI/FFS, mainly consisting of discrepancies between the Section 7.0 table series and the summary of these tables in the main text and in-text tables. These inconsistencies are minor and do not change the conclusions of the risk assessments. This PP was prepared to reflect the most accurate values and may deviate from the information presented in the RI/FFS.

***Constituents of Concern***

The COCs in soil being addressed by this remedy are arsenic, antimony, lead, and carcinogenic PAHs including benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene. These COCs have been detected in soil at concentrations that would potentially present an unacceptable risk to human and terrestrial receptors. In addition, lead shot and clay target fragments are being managed as potential sources of COCs to surface soil preventing future exposures to COCs above protective levels. The Preferred Alternative also addresses controlling the potential risk to ecological receptors from ingestion of lead shot pellets. Based on the definition provided in the U.S. EPA Superfund Publication – A Guide to Principal Threat and Low Level Threat Wastes (9380.3-05FS; U.S. EPA 1991), impacted media and surficial munitions debris at the Site is not deemed a principal threat waste.

***Human Health Risk Assessment***

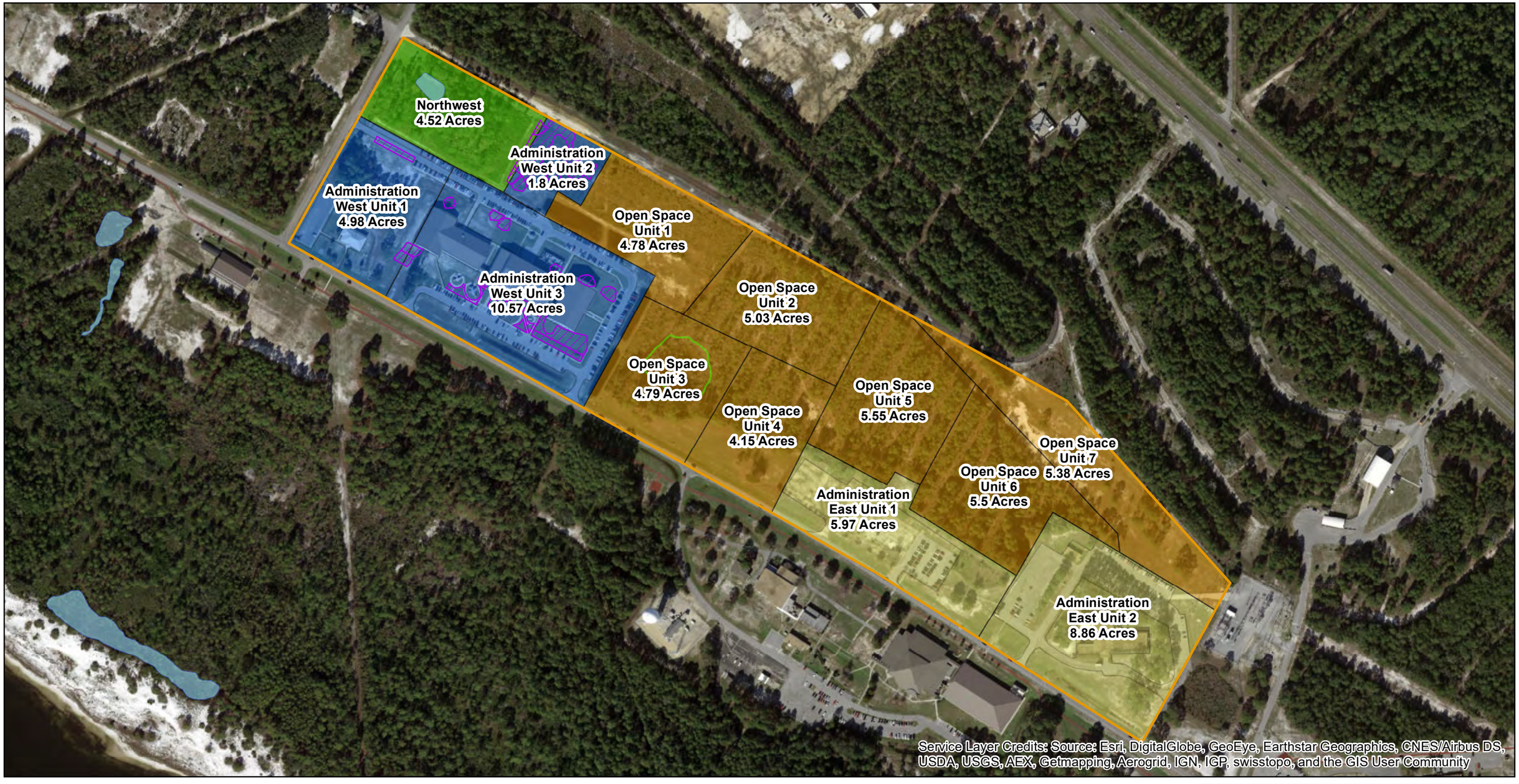
The HHRA presented in the 2017 RI/FFS evaluates risks and hazards to human health associated with various soil exposure scenarios at FR038. The site was divided into decision units ranging between approximately 2 and 11 acres based on relative location and characteristics **(Figure 3)**. Five decision units are currently occupied by buildings and maintained landscaping used for commercial/industrial purposes. The eight remaining decision units are in open space wooded areas available for recreational use and ecological receptors. Groundwater was also evaluated for potential exposures to site workers and future hypothetical residents; however, the assessment indicated that groundwater does not pose a potential risk above background levels. Surface water and sediment of the small pond located in the northeast corner of the site were not carried through the risk assessment process based on the isolated nature of these media and the low constituent concentrations detected on site.

Much of the site is currently used for silviculture, but future development is planned for FR038 (with a land use best classified as commercial/industrial). Thus, the current and future primary human receptor population is considered to be commercial/industrial workers (i.e., base personnel) and construction/utility workers. Trespasser populations are not likely receptors, because the site is within the secured/limited access of Tyndall AFB. Recreational users are evaluated for the wooded silviculture area.

Conclusions of the HHRA indicate that unacceptable risks to human health and the environment exist at the FR038 from lead, HPAHs, arsenic, and antimony in surface soil. **Table 3** provides a summary of the incremental lifetime cancer risks (ILCRs) and risk drivers for soil at FR038. Reported ILCRs exceed the 1-in-one million (1E-06) for all decision units for potential residents, for 12 of the 13 decision units for site workers, and 8 of the 13 decision units for recreational users based on exposure to carcinogenic PAHs and arsenic in soil. The ILCRs for construction workers only exceed 1E-06 at two of 13 decision units (Open Space Units 1 and 4). Hazard indices (HIs) for non-cancer endpoints are also summarized in Section 7.2 of the RI/FFS. HIs exceed 1 for site workers and construction workers in two of 13 decision units and for potential residents in three of 13 decision units.

Exposures to lead in soil were evaluated based on modeled absorbed doses using the U.S. EPA's Adult Lead Model for adult exposures and the U.S. EPA's integrated exposure uptake biokinetic (IEUBK) model for child exposures. **Table 4** provides a summary of adult exposures to lead in soil based on site worker and construction worker scenarios, and child exposures to lead in site soil based on recreational user and residential scenarios. Modeled probabilities of absorbed doses of lead in fetal blood of pregnant adult women exceed the target blood lead level of 10 micrograms per deciliter (µg/dL) in greater than 5 percent of population exposed to soil from two decision units for site workers and three decision units for construction workers. A total of six decision units out of 13 had modeled child blood lead levels above the target of 10 µg/dL based on the residential exposure scenario.

There is a high degree of uncertainty as to whether lead shot in soil posed a direct risk to human health; however, based on lead dissolution study completed in 2015 future risk from lead in the shot pellets loading onto soil was determined possible at densities above 335 to 802 pellets per square foot (SF), depending upon the soil characteristics (Arcadis 2017). The 800 pellets per SF density is applicable to the upland soils present over the entire site with the exception of the ephemeral wetland area in Decision Unit 3, where the 335 pellets per SF density is applicable.




**Legend**

- Beacon Beach Skeet Range (FR038)
- 2015 NTCRA Footprint
- Buildings and Parking Areas
- Ephemeral Wetland
- Surface Water
- Administration East Expsoure Unit
- Administration West Expsoure Unit
- Northwest Open Space Exposure Unit
- Open Space Exposure Unit

**Notes:**
- NTCRA - Non-Time Critical Removal Action.

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## Exposure Units
## Beacon Beach Skeet Range (FR038)

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FIGURE
3

**Table 3**
**Summary of ILCR and HI for FR038 Soil**

| Decision Unit | ILCR | Risk Driver | HI | Hazard Driver |
|---|---|---|---|---|
| **Site Worker** | | | | |
| Open Space Unit 1 | **2.6E-04** | BaA/BaP/BbF/DahA | 3.2E-02 | -- |
| Open Space Unit 2 | **4.4E-05** | BaP/BbF | 1.1E-02 | -- |
| Open Space Unit 3 | **1.0E-04** | BaA/BaP/BbF/DahA | 1.0E-01 | -- |
| Open Space Unit 4 | **7.6E-04** | BaP/BbF/DahA | 3.2E-02 | -- |
| Open Space Unit 5 | **1.5E-04** | As | **4.3E+00** | Sb |
| Open Space Unit 6 | **4.8E-05** | As/BaP | **1.5E+00** | Sb |
| Open Space Unit 7 | **3.6E-06** | As/BaP | 5.0E-02 | -- |
| Admin East Unit 1 | **7.6E-05** | BaA/BaP/BbF/DahA | 6.5E-03 | -- |
| Admin East Unit 2 | **3.3E-06** | BaA/BaP/BbF/DahA | 3.9E-02 | -- |
| Admin West Unit 1 | **5.6E-06** | BaP/BbF/DahA | 1.5E-03 | -- |
| Admin West Unit 2 | 6.2E-07 | -- | 0.0E+00 | -- |
| Admin West Unit 3 | **3.2E-06** | BaP/BbF/DahA | 3.8E-03 | -- |
| Northwest | **1.8E-06** | As/BaP | 1.9E-02 | -- |
| **Construction Worker** | | | | |
| Open Space Unit 1 | **2.2E-06** | -- | 4.5E-02 | -- |
| Open Space Unit 2 | 2.0E-07 | -- | 2.3E-02 | -- |
| Open Space Unit 3 | 9.4E-07 | -- | 3.3E-01 | -- |
| Open Space Unit 4 | **3.4E-06** | BaP/BbF | 5.6E-02 | -- |
| Open Space Unit 5 | 9.9E-07 | -- | **3.3E+00** | Sb |
| Open Space Unit 6 | 5.6E-07 | -- | **1.9E+00** | Sb |
| Open Space Unit 7 | 5.9E-08 | -- | 5.8E-02 | -- |
| Admin East Unit 1 | 8.9E-07 | -- | 3.2E-02 | -- |
| Admin East Unit 2 | 1.9E-07 | -- | 1.6E-01 | -- |
| Admin West Unit 1 | 3.2E-08 | -- | 2.9E-02 | -- |
| Admin West Unit 2 | 3.1E-08 | -- | 0.0E+00 | -- |
| Admin West Unit 3 | 1.4E-07 | -- | 7.2E-02 | -- |
| Northwest | 7.3E-08 | -- | 3.7E-02 | -- |
| **Recreational Child/Youth** | | | | |
| Open Space Unit 1 | **2.7E-04** | BaA/BaP/BbF/DahA | 1.6E-02 | -- |
| Open Space Unit 2 | **4.6E-05** | BaP/BbF | 1.1E-03 | -- |
| Open Space Unit 3 | **1.0E-04** | BaA/BaP/BbF/DahA | 2.0E-02 | -- |
| Open Space Unit 4 | **8.0E-04** | BaP/BbF/DahA | 3.8E-02 | -- |
| Open Space Unit 5 | **1.1E-05** | As | 1.2E-01 | -- |
| Open Space Unit 6 | **2.3E-05** | As/BaP | 2.0E-01 | -- |
| Open Space Unit 7 | **1.4E-06** | As/BaP | 6.1E-03 | -- |
| Northwest | **1.6E-06** | As/BaP | 2.4E-03 | -- |

**Table 3**
**Summary of ILCR and HI for FR038 Soil**

| Decision Unit | ILCR | Risk Driver | HI | Hazard Driver |
|---|---|---|---|---|
| **Residential** | | | | |
| Open Space Unit 1 | **5.3E-03** | BaA/BaP/BbF/DahA | 6.6E-01 | -- |
| Open Space Unit 2 | **9.1E-04** | BaP/BbF | 1.3E-01 | -- |
| Open Space Unit 3 | **2.0E-03** | BaA/BaP/BbF/DahA | **1.8E+00** | As |
| Open Space Unit 4 | **1.6E-02** | BaP/BbF/DahA | 7.9E-01 | -- |
| Open Space Unit 5 | **8.2E-04** | As | **7.2E+01** | Sb |
| Open Space Unit 6 | **7.3E-04** | As/BaP | **3.0E+01** | Sb |
| Open Space Unit 7 | **2.8E-05** | As/BaP | 8.5E-01 | -- |
| Admin East Unit 1 | **1.6E-03** | BaA/BaP/BbF/DahA | 1.2E-01 | -- |
| Admin East Unit 2 | **3.1E-05** | BaA/BaP/BbF/DahA | 6.9E-01 | -- |
| Admin West Unit 1 | **1.1E-04** | BaP/BbF/DahA | 6.6E-02 | -- |
| Admin West Unit 2 | **1.3E-05** | BaP/BbF/DahA | 0.0E+00 | -- |
| Admin West Unit 3 | **9.5E-05** | BaP/BbF/DahA | 1.4E-01 | -- |
| Northwest | **3.2E-05** | As/BaP | 3.8E-01 | -- |

**Notes**:
1) Bold values represent ILCR in excess of 1E-06 target level presented in 62-780 and/or HI greater than 1.
2) BaA = benzo(a)anthracene; BaP = benzo(a)pyrene, BbF = benzo(b)fluoranthene; DahA = dibenz(a,h)anthracene; As – arsenic; Sb = antimony.

**Table 4**
**Summary of U.S. EPA's Adult Lead Model and IEUBK Model Output for FR038**

| Decision Unit | Average Pb (mg/kg) | 95% Fetal PbB | Probability > 10 µg/dL |
|---|---|---|---|
| **Adult Lead Model - Site Worker** | | | |
| Open Space Unit 1 | 624 | 4.5 | 0.1% |
| Open Space Unit 2 | 925 | 3.5 | 0.4% |
| Open Space Unit 3 | 1,946 | 9.0 | 3.4% |
| Open Space Unit 4 | 601 | 4.4 | 0.1% |
| Open Space Unit 5 | 6,823 | **25.6** | **48.0%** |
| Open Space Unit 6 | 3,040 | **12.7** | **10.8%** |
| Open Space Unit 7 | 236 | 3.2 | 0.1% |
| Admin East Unit 1 | 217 | 3.1 | 0.1% |
| Admin East Unit 2 | 171 | 2.9 | 0.1% |
| Admin West Unit 1 | -- | -- | -- |
| Admin West Unit 2 | -- | -- | -- |
| Admin West Unit 3 | 164 | 2.9 | 0.1% |
| Northwest | 213 | 2.9 | 0.1% |

**Table 4**
**Summary of U.S. EPA's Adult Lead Model and IEUBK Model Output for FR038 (Continued)**

| Decision Unit | Average Pb (mg/kg) | 95% Fetal PbB | Probability > 10 µg/dL |
|---|---|---|---|
| **Adult Lead Model - Construction Worker** | | | |
| Open Space Unit 1 | 208 | 7.9 | 2.1% |
| Open Space Unit 2 | 245 | 8.1 | 3.3% |
| Open Space Unit 3 | 954 | **27.9** | **54.0%** |
| Open Space Unit 4 | 273 | 9.7 | 4.4% |
| Open Space Unit 5 | 1,518 | **43.0** | **79.9%** |
| Open Space Unit 6 | 946 | **26.9** | **55.5%** |
| Open Space Unit 7 | 88 | 4.7 | 0.2% |
| Admin East Unit 1 | 73 | 4.3 | 0.1% |
| Admin East Unit 2 | 122 | 5.6 | 0.4% |
| Admin West Unit 1 | -- | -- | -- |
| Admin West Unit 2 | -- | -- | -- |
| Admin West Unit 3 | 99 | 5.0 | 0.2% |
| Northwest | 160 | 6.7 | 1.0% |
| **Decision Unit** | **$PbS_w$ (mg/kg)** | **Geometric Mean Fetal PbB** | **Probability > 10 µg/dL** |
| **IEUBK Model - Recreational Child/Youth** | | | |
| Open Space Unit 1 | 297 | 3.6 | 1.5% |
| Open Space Unit 2 | 318 | 3.8 | 1.9% |
| Open Space Unit 3 | 389 | 4.4 | 3.9% |
| Open Space Unit 4 | 309 | 3.7 | 1.7% |
| Open Space Unit 5 | 731 | 7.1 | **22.9%** |
| Open Space Unit 6 | 499 | 5.0 | **7.1%** |
| Open Space Unit 7 | 296 | 3.6 | 1.5% |
| Northwest | 268 | 3.3 | 0.98% |
| **IEUBK Model – Residential** | | | |
| Open Space Unit 1 | 624 | 6.5 | **18.7%** |
| Open Space Unit 2 | 925 | 8.7 | **38.5%** |
| Open Space Unit 3 | 1,946 | **14.7** | **79.3%** |
| Open Space Unit 4 | 601 | 6.4 | **17.0%** |
| Open Space Unit 5 | 6,823 | **32.1** | **99%** |
| Open Space Unit 6 | 3,040 | **19.7** | **92.6%** |
| Open Space Unit 7 | 236 | 3.4 | 1.1% |
| Admin East Unit 1 | 217 | 3.2 | 0.8% |
| Admin East Unit 2 | 171 | 2.8 | 0.4% |
| Admin West Unit 1 | -- | -- | -- |
| Admin West Unit 2 | -- | -- | -- |
| Admin West Unit 3 | 164 | 2.8 | 0.3% |
| Northwest | 213 | 3.2 | 0.8% |

**Notes**:
Bold values associated with PbB greater than 10 µg/dL and probability exceeding 5%.
Pb = lead, mg/kg = milligrams per kilogram, $PbS_w$ = Time-weighted average concentrations of lead in soil

**Table 5**
**Summary of $HQ_{LOAEL}$ for Mammalian and Avian Measurement Endpoints**

| Decision Unit | COPEC | $HQ_{LOAEL}$ |
|---|---|---|
| **Mammalian Herbivore – Meadow Vole** | | |
| Open Space Unit 1 | Sb, HPAHs | 1.1, 48 |
| Open Space Unit 2 | HPAHs | 10 |
| Open Space Unit 3 | Sb, HPAHs | 2.4, 14 |
| Open Space Unit 4 | HPAHs | 170 |
| Open Space Unit 5 | Sb, As, Pb, HPAHs | 170, 3.5, 12, 3.2 |
| Open Space Unit 6 | Sb, As, Pb, HPAHs | 74, 1.4, 5.3, 2.3 |
| Open Space Unit 7 | Sb | 2 |
| **Mammalian Omnivore – Deer Mouse** | | |
| Open Space Unit 1 | HPAHs, LPAHs | 12, 1.6 |
| Open Space Unit 2 | HPAHs | 2.8 |
| Open Space Unit 3 | Sb, HPAHs | 1.1, 3.8 |
| Open Space Unit 4 | HPAHs, LPAHs | 41, 3.9 |
| Open Space Unit 5 | Sb, As, Pb | 82, 3, 2.7 |
| Open Space Unit 6 | Sb, As, Pb | 35, 1.2, 1.2 |
| **Mammalian Insectivore – Shrew** | | |
| Open Space Unit 1 | HPAHs | 17 |
| Open Space Unit 2 | HPAHs | 4.3 |
| Open Space Unit 3 | Sb, HPAHs | 1.9, 6.1 |
| Open Space Unit 4 | HPAHs, LPAHs | 57, 6.6 |
| Open Space Unit 5 | Sb, As, Pb, HPAHs | 140, 5.9, 9.7, 1.2 |
| Open Space Unit 6 | Sb, As, Pb, HPAHs | 59, 2.3, 4.2, 1.2 |
| Open Space Unit 7 | Sb | 1.6 |
| **Mammalian Carnivore – Red Fox** | | |
| Open Space Unit 4 | HPAHs | 1.1 |
| Open Space Unit 5 | Sb, Pb | 1.4, 1.2 |
| **Avian Herbivore – Mourning Dove** | | |
| Open Space Unit 1 | HPAHs | 1.9 |
| Open Space Unit 4 | HPAHs | 6.3 |
| Open Space Unit 5 | Pb | 3.3 |
| Open Space Unit 6 | Pb | 1.4 |
| **Avian Omnivore– Robin** | | |
| Open Space Unit 1 | HPAHs | 3.1 |
| Open Space Unit 3 | Pb, HPAHs | 1.2, 1.2 |
| Open Space Unit 4 | HPAHs, LPAHs | 9.6, 1.3 |
| Open Space Unit 5 | As, Pb | 1.2, 15 |
| Open Space Unit 6 | Pb | 6.3 |
| **Avian Insectivore – American Woodcock** | | |
| Open Space Unit 1 | HPAHs | 3.0 |
| Open Space Unit 3 | Pb, HPAHs | 1.2, 1.2 |
| Open Space Unit 4 | HPAHs, LPAHs | 8.7, 1.2 |
| Open Space Unit 5 | As, Pb | 1.6, 15 |
| Open Space Unit 6 | Pb | 6.3 |
| **Avian Carnivore– Red-tailed Hawk** | | |
| All $HQ_{LOAEL}$ below 1 | | |

**Notes**:
LPAH = Low molecular weight PAHs
HPAH = High molecular weight PAHs

***Ecological Risk Assessment***

An ERA was also performed as part of the 2017 RI/FFS to evaluate potential unacceptable risks to wildlife from exposure to site-related constituents detected in surface soil. Of the endangered, threatened, and special concern animals or plants confirmed to occur on Tyndall AFB, no federally listed species are likely or have been reported to dwell within FR038.

Results of the ERA indicate that unacceptable risks to ecological receptors exist at the FR038 from arsenic, antimony, lead, and PAHs in surface soil. **Table 5** provides a summary of the hazard quotients (HQs) for the evaluation of lowest observable adverse effect level (LOAEL) end points. HQs ranged from less than one to 170 for mammalian receptors and from less than 1 to 15 for avian receptors. The highest HIs were for antimony in mammals and lead in avian receptors. Exceedances occurred in seven of eight open space decision units. In addition, the need for remediation of FR038 to reduce shot pellet density was evaluated to reduce the potential risk of lead shot pellet ingestion by upland birds.

## 7. Establishing Remedial Goals

***Remedial Action Objectives***

RAOs are site-specific initial cleanup objectives established based on the nature and extent of contamination, resources that are currently and potentially threatened, and potential for human and environmental exposure. Because lead and carcinogenic PAHs in soil are the primary risk-driving COCs at FR038, the RAOs included in the RI/FFS focused on soil contamination. The results of the risk assessments indicate that groundwater, surface water, sediment, and stormwater do not represent a potential risk to human and ecological receptors; therefore, remediation of these media was not included in the alternatives. The RAOs presented in the RI/FFS for soil remediation included:

- Reduce potential cancer risk and potential non-cancer health hazards for people (i.e., site workers/base personnel, construction workers, and recreational users) exposed to lead and HPAHs in contaminated soils by reducing the concentrations of or controlling exposure to these COCs in soils.
- Reduce or control potential exposure to areas identified with visual munitions debris (lead shot and clay target fragments) in surface soil.
- Reduce potential exposure of ecological receptors to COCs and metal debris in soil.
- Prevent migration of unacceptable levels of lead and HPAHs to off-Site locations.

***Remedial Goals***

Risk-based exposure equations and assumptions were used to calculate site-specific risk-based RGOs. The RGOs were developed for surface soil due to unacceptable excess lifetime cancer risks from carcinogenic PAHs and arsenic to site workers and unacceptable health hazards from antimony and lead to site workers and construction workers. Based on a non-residential future use scenario established by the U.S. AF, the reasonable maximum exposure would be a current/future commercial/industrial worker (i.e., base personnel). This particular future use scenario led to the use of commercial/industrial remedial goals rather than residential remedial goals.

In accordance with Chapter 62-777, Florida Administrative Code (FAC), the seven carcinogenic PAHs were converted to benzo(a)pyrene equivalents before comparison with the industrial direct contact CTL for benzo(a)pyrene using the approach described in the February 2005 “Final Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, FAC.” The benzo(a)pyrene conversion table/calculator is presented as **Appendix A.**

The following human health-based remedial goals were developed for COCs at the site:

- BaP TEQ: 1.49 milligrams per kilogram (mg/kg)
- Arsenic: 4.3 mg/kg
- Antimony: 370 mg/kg
- Lead (site worker): 1,100 mg/kg
- Lead (construction worker): 1,900 mg/kg

The following ecological-based RGOs were developed for COCs at the site:

- HPAHs: 23 mg/kg
- Arsenic: 39 mg/kg
- Antimony: 5 mg/kg
- Lead: 1,208 mg/kg

In addition, the following RGOs were established for lead shot and clay target fragments:

- Lead Shot: 335/802 pellets per SF for protection of human health from future loading of lead to soil in wetlands and uplands, respectively, and <130 pellets per SF average over the entire 40-acre wooded area for protection of avian receptors from ingestion of lead shot pellets as grit
- Clay target fragments: 16 grams per SF.

## 8. Summary of Remedial Alternatives

General response actions (GRAs) are categories of remedial actions that may be implemented alone or in combination to satisfy RGOs. GRAs were developed for soil at FR038.

Appropriate GRAs for soil remediation at FR038 were developed based on the identified RAOs, site-specific conditions, and contaminant characteristics. The GRAs considered for soil remediation at FR038 include:

- No Action
- Monitoring – Environmental Media Sampling (routine soil monitoring to assess changes over time)
- LUCs (administrative [institutional] and physical [engineering] means to control activities at the site)
- Capping (isolate contaminants that are left in place)
- Soil Vertical Barriers (berm or a sediment screen to reduce additional migration of soils)
- Surface Water Diversion (diversion channels to intercept stormwater runoff or reduce slope length and transfer the diverted water to another discharge location)
- Dust Controls (techniques to minimize migration of contaminants via air born particulate during intrusive activities)
- Removal (excavating impacted soil)
- Disposal (permanently placing treated or untreated impacted soil in an appropriate disposal facility)
- Ground Cover Restoration (reducing the potential for soil erosion from areas of the site that have undergone excavation or have been highly trafficked, or otherwise disturbed)
- Ex-Situ Soil Stabilization (chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility [stabilization]).

Based on screening of each of the GRAs for effectiveness, implementability, and cost, the following three remedial alternatives were retained for FR038:

- Alternative 1 – No Additional Action
- Alternative 2 – Surface Soil Removal, Stabilized Soil Cover, and LUCs to Address Industrial Worker Risk
- Alternative 3 – Surface and Subsurface Soil Removal to Address Industrial Worker Risk, Construction Worker Risk, and Lead Mass Removal Optimization, and LUCs

***Alternative 1: No Additional Action***

Under Alternative 1, no additional corrective action of any kind would be employed. This alternative would not adequately control the chemical hazard or risks posed by the COCs. However, the no action alternative must be evaluated [per 40 CFR 300.430(e)(6)] to establish a baseline of comparison regarding future performance and risk for the remaining alternatives. There are no present-worth costs and capital costs for the no action alternative because no action would be taken. No action precludes any future beneficial use of the site because it would not be protective of human health and the environment, and would result in continued unacceptable exposure risks.

***Alternative 2: Surface Soil Removal, Stabilized Soil Cover, and LUCs to Address Industrial Worker Risk***

Alternative 2 entails the excavation, transport, and disposal of surface soil (less than 1 foot) to prevent direct contact with COCs that result in an unacceptable cancer risk or non-cancer hazard to site workers. Soils will be targeted to achieve a 95% upper confidence limit of residual concentrations below RGOs. In addition, this alternative assumes the excavation of the shallow soil that contains clay target fragments at amounts in excess of 48 grams per square foot and lead shot visible on the ground surface. Finally, the alternative includes clearing and grubbing the entire wooded area at FR038, grading and establishment of cover material, establishing and maintaining a vegetative cover, and limiting site use as habitat for ecological receptors. The area proposed for excavation is shown on **Figure 4**.

In addition, the former location of Building 1270 (demolished in 2013) will be managed under this alternative, and soil removal will occur in this area as necessary to meet remedial goals.

Administrative LUCs will be established prohibiting uncontrolled excavations and future use of the site for residential purposes. FR038 is planned for continued use as a commercial/industrial site; however, an institutional control must be in place to remove the potential for residential exposure of COCs that pose a potential risk to hypothetical future residents.

Characterization of the nature and distribution of COCs in surface soil demonstrate that a majority of the mass of lead and HPAHs in soil occurs within the first 1 foot of surface soil at FR038.

The 0- to1-foot interval provides sufficient barrier to protect commercial/industrial workers and ecological receptors from residual concentrations of lead and PAHs in subsurface soil, and residual contamination below 1 foot does not pose a risk to groundwater. Because the depth of excavation is pre-defined, confirmation samples are not included in this alternative. In addition, this alternative mitigates risk to the construction worker via LUCs including signage, dig permits requirements, and land use restrictions (i.e., prohibition of residential land use, uncontrolled excavation, and the prohibition of the use of groundwater located beneath the site).

A Contractor Health and Safety Plan would be developed for the remedial action that sets action levels for respirable dust and establishes specific personal protective equipment for workers exposed to this soil, including protection of the pregnant construction worker from lead impacted soil. Long-term maintenance (LTM) at the site would also be conducted to ensure that the selected remedy continues to be protective (i.e., site inspections and CERCLA 5-year reviews). A detailed cost analysis for this alternative is presented in the 2017 RI/FFS. Estimated present worth costs are summarized in **Table 6**.

***Alternative 3: Surface and Subsurface Soil Removal Action to Address Industrial Worker Risk, Construction Worker Risk, and Lead Mass Removal Optimization***

Alternative 3 includes excavation, transport, and disposal of surface and subsurface soil that exceed the soil industrial remedial goals to

prevent direct contact with COCs. Alternative 3 differs from Alternative 2 in that it assumes that construction workers have the potential to be exposed to subsurface soil (e.g., utility trenching, building foundation excavation, and other activities). Therefore, excavation, transportation, and disposal of soil to depth (where subsurface concentrations exceed soil remedial goals) will mitigate the risk/hazard posed by impacted soil to the industrial and construction worker. Alternative 3 also includes: (1) excavation of soil with visible lead shot and (2) optimization of lead shot removal based on a spatial evaluation of shot density in soil. This evaluation allows for maximizing lead mass reduction, while minimizing the amount of additional excavation volume. The area proposed for excavation is shown on **Figure 5**.

Alternative 3 would use many of the same materials and methods employed in Alternative 2 to implement the excavation, stabilization (as necessary), transportation, and disposal of soil that contains COCs at concentrations exceeding the remedial goals. The former location of Building 1270 will be managed under both alternatives. The primary differences between Alternative 3 and Alternative 2 are:

1) The final extent of the excavation is contingent upon the results of the post-excavation confirmation sampling.

2) Additional soil is excavated to optimize lead shot mass removal.

Although Alternative 3 mitigates all site risks/hazards for the reasonably anticipated uses of the site, COCs will remain at the site at concentrations that do not allow for unrestricted use. Therefore, LUCs and LTM will be implemented in the same manner described for Alternative 2.

A detailed cost analysis for this alternative is presented in the 2017 RI/FFS. Estimated present worth costs are summarized in **Table 6**.

## 9. Evaluation of Alternatives

40 CFR §300.430(e)(9) of the NCP identifies nine criteria against which each remedial alternative must be assessed. **Table 7** provides a summary of each of the criteria. The objective of the analysis of remedial alternatives is to determine the alternatives that satisfy the required evaluation criteria to help select the best remedial actions for the site.

The first two threshold criteria (which must be met by each alternative) are:

1. Protection of human health and the environment
2 Compliance with ARARs

The next five primary balancing criteria upon which the analysis is based are:

3 Long-term effectiveness and permanence

4 Reduction of toxicity, mobility, and volume

5 Short-term effectiveness

6 Implementability

7 Cost.

The final two modifying criteria are evaluated following receipt of comments on the Proposed Plan so that state and community acceptance may be evaluated.

8 State acceptance

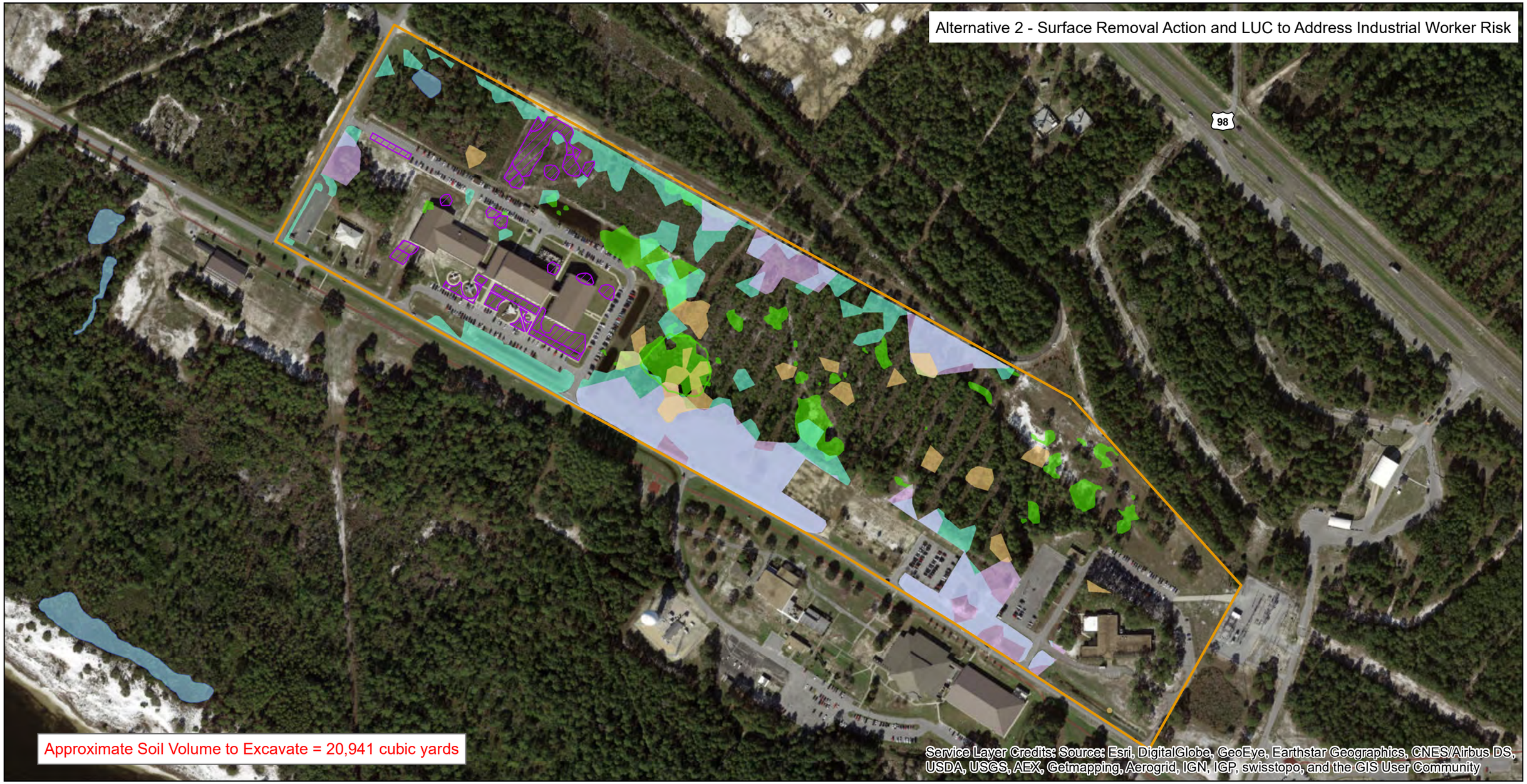
9 Community acceptance.

The summary of how each alternative either met or failed to meet the nine CERCLA criteria is presented in the RI/FFS and is also provided in this section. The comparative analysis of alternatives was performed criterion-by-criterion, emphasizing the important tradeoffs among alternatives.

**Table 6**
**Cost Comparison of Alternatives**

| Alternative Description | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| | No Additional Action | Surface Soil Removal Action, Stabilized Soil Cover, and LUCs to Address Industrial Worker Risk | Surface and Subsurface Removal Action to Address Industrial Worker Risk, Construction Worker Risk, and Lead Mass Removal Optimization |
| Capital Costs | $0 | $8,342,671 | $11,127,014 |
| Total Present Worth of Annual O&M | $0 | $476,413 | $135,200 |
| Total Present Worth | $0 | $8,819,000 | $11,262,000 |

**Note:** The Total Present Worth is the sum of the Capital Costs and Total Present Worth of Annual Costs rounded to the neared $1000. Details on the costs estimates are provided in the RI/FSS.




**Legend**

- Beacon Beach Skeet Range (FR038)
- 2015 NTCRA Footprint
- Ephemeral Wetland
- Surface Water

**Alternative 2 Excavation Area**

- Excavation based on Lead Concentration
- Excavation based on BaP Concentration
- Excavation based on Clay Target Fragment Mass per Area
- Excavation based on Interpolated Lead Shot on Ground Surface

**Notes:**

- BaP TEQ - Benzo(a)Pyrene Toxicity Equivalent.
- COC - Constituent of Concern.
- ft bgs - feet below ground surface.
- NTCRA - Non-Time Critical Removal Action.
- LUC - Land Use Control.
- PRG - Preliminary Remediation Goal.
- UCL - Upper Confidence Limit.

**Notes:**

- Under Alternative 2, surface soils (0 to 1 ft bgs) with lead, BaP TEQs, and clay target fragments exceeding three times the PRGs would be removed from the site.
Additional soils are removed, as necessary, to statistically meet PRGs.
- 95% UCLs for COCs were determined for site soils remaining after the proposed excavation (0 to 1 ft bgs) and are below PRGs.
- The excavation area was determined by developing Thiessen polygons. This method was selected because it provides an unbiased area based on sampling results.

N

0 250 500

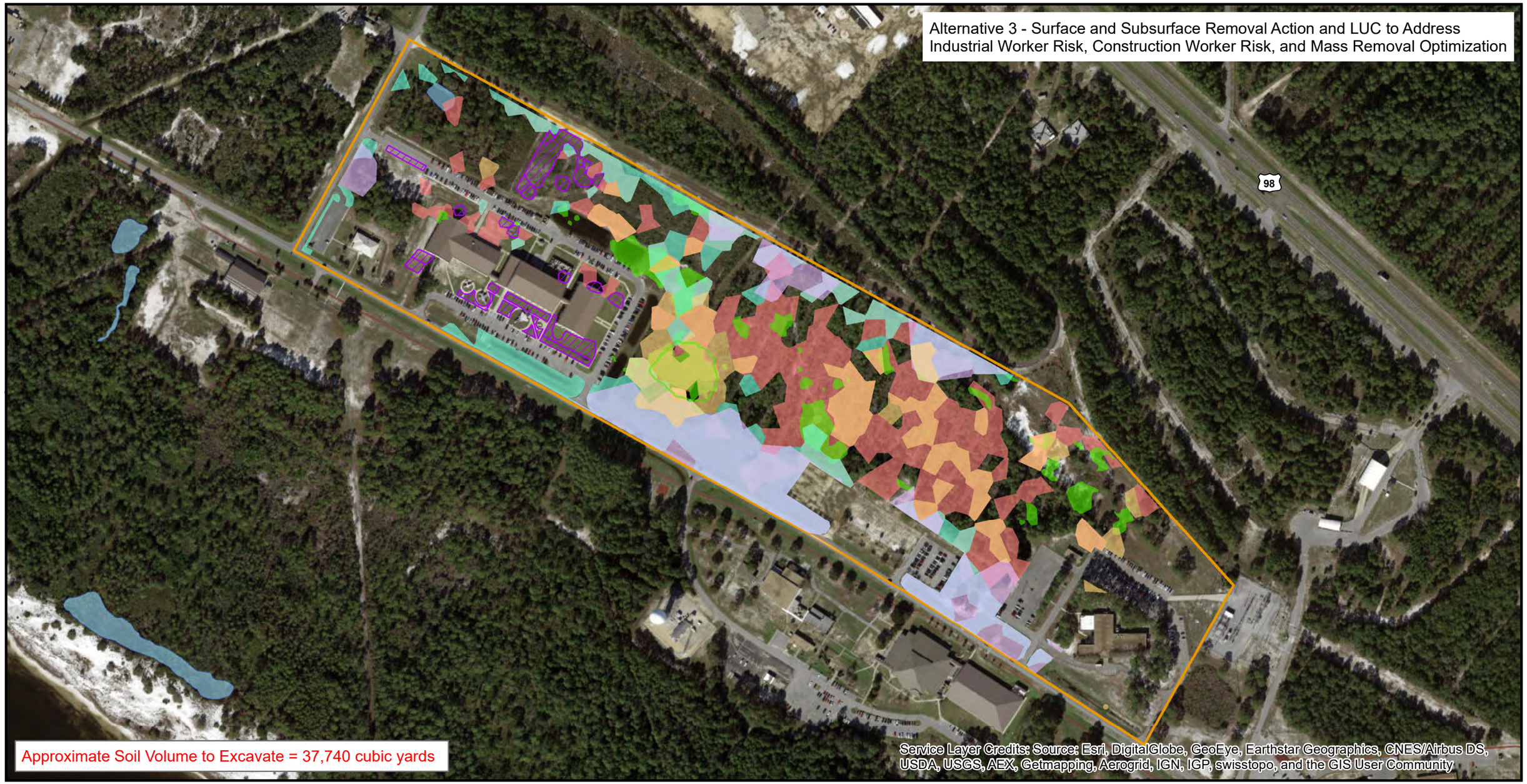
Feet

TYNDALL AIR FORCE BASE
FLORIDA

**Alternative 2**
**Beacon Beach Skeet Range (FR038)**

ARCADIS

FIGURE
**4**




**Legend**

- Beacon Beach Skeet Range (FR038)
- 2015 NTCRA Footprint
- Ephemeral Wetland
- Surface Water

**Alternative 3 Excavation Area**

- Excavation based on Lead Concentration
- Excavation based on BaP Concentration
- Excavation based on Clay Target Fragment Mass per Area
- Excavation based on Interpolated Lead Shot on Ground Surface
- Excavation based on Lead Shot Optimization

**Notes:**

- BaP TEQ - Benzo(a)Pyrene Toxicity Equivalent.
- COC - Constituent of Concern.
- NTCRA - Non-Time Critical Removal Action.
- LUC - Land Use Control.
- PRG - Preliminary Remediation Goal.
- UCL - Upper Confidence Limit.

**Notes:**

- Under Alternative 3, surface and subsurface soils with lead, BaP TEQs, and clay target fragments exceeding three times the PRGs would be removed from the site. Additional soils are removed, as necessary, to statistically meet PRGs.
- 95% UCLs for COCs were determined for site soils remaining after the proposed excavation and are below PRGs.
- The excavation area was determined by developing Thiessen polygons. This method was selected because it provides an unbiased area based on sampling results.

N

0 250 500

Feet

TYNDALL AIR FORCE BASE
FLORIDA

**Alternative 3**
**Beacon Beach Skeet Range (FR038)**

ARCADIS

FIGURE
**5**

**Table 7**
**Evaluation Criteria for Superfund Remedial Alternatives**

| |
|---|
| **Overall Protectiveness of Human Health and the Environment** *determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment. Will the alternative protect human health and the environment?* |
| **Compliance with ARARs** e*valuates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is* justified*. Does the alternative meet all pertinent federal and state environmental statutes, regulations, and requirements?* |
| **Long-term Effectiveness and Permanence** c*onsiders the ability of an alternative to maintain protection of human health and the environment over time. How reliable will the alternative be at long-term protection of human health and the environment?* |
| **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment** *evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present. How reliable will the alternative be at long-term protection of human health and the environment?* |
| **Short-term Effectiveness** c*onsiders the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation. Does the alternative incorporate treatment to reduce the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present?* |
| **Implementability** c*onsiders the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services. Is the alternative technically and administratively feasible and goods and services needed to implement the alternative (e.g., treatment machinery, space at an approved disposal facility) readily available?* |
| **Cost** *includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. What is the total cost of constructing and operating the alternative? Cost estimates are expected to be accurate within a range of +50 to -30 percent.* |
| **State/Support Agency Acceptance** c*onsiders whether the State agrees with the analyses and recommendations, as described in the RI/FS and Proposed* Plan*. Do state environmental agencies agree with the recommendations?* |
| **Community Acceptance** c*onsiders whether the local community agrees with analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance. What suggestions, concerns or modifications do residents of the community offer during the comment period?* |

**Source:** A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA 1999)

***Protection of Human Health and the Environment***

This criterion addresses the degree, extent, and manner in which the alternative achieves protection of human health and the environment through time. Protection of human health and the environment is met if each human health and ecological exposure pathway identified in the risk assessment as potentially resulting in adverse effects is eliminated, reduced to an acceptable level, or controlled through treatment or engineering and LUCs.

Alternative 1, No Additional Action, does not provide any added protection to human health or the environment because this alternative does not include removal, treatment, or containment of any of the impacted soil, or LUCs. Because Alternative 1 does not meet this threshold criterion, it will not be evaluated with the balancing criteria.

Alternative 2 provides adequate protection of human health from exposure to unacceptable concentrations of COCs in surface soil. Residual lead shot in soil meet the remediation goal of protecting against future concentrations of lead in soil exceeding the 1,100 mg/kg cleanup goal. The average residual lead shot in soil across the site is 199 pellets per SF, which is above the upper RGO of 130 pellets per SF average for the 40 acres of available habitat at the site. This alternative also does not achieve ecological RGOs for mammalian receptors based on concentrations of antimony in surface soil. This pathway is addressed by the establishment and maintenance of a vegetated cover that removes the exposure pathway to COCs in soil and minimizes the attraction of birds and other wildlife to forage in the area. Re-development and maintenance of the site as a commercial

industrial property with a vegetated soil cover also reduces the likelihood of attracting these wildlife receptors.

Alternative 2 remediates the site to industrial RGOs by removing contaminated soil down to 1 foot below the surface (i.e., Alternative 2 mitigates industrial risks/hazards and controls construction risks/hazards). Alternative 3 will provide a greater degree of protection for human health and the environment from the short-term and long-term risks because the contaminated soil at any depth will be removed, thus mitigating both industrial and construction risk/hazards. In addition, Alternative 3 achieves all ecological-based RGOs both for COCs in soil and removes a greater mass of lead shot from the site. Alternative 3 provides greater risk protection in both the short term and the long term. In the short term, a majority of impacted soil is removed, eliminating current exposure. For the long term, the mass of lead shot in soil will be decreased to less than 130 pellets per SF, reducing the future potential release of lead to site soils. Both alternatives include administrative and engineering controls restricting residential development of the site and require LTM.

***Compliance with Applicable or Relevant and Appropriate Requirements***

Section 121(d) of CERCLA, as amended, specifies, in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site or obtain a waiver. ARARs include only federal and state environmental or facility siting laws/regulations, and do not include occupational safety or worker protection requirements.

In addition to ARARs, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The "to be considered" category consists of advisories, criteria, or guidance that were developed by the U.S. EPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

The ARARs used for evaluation of the alternatives are included in Section 8.2 of the RI/FFS.

Alternative 1 is not compliant with chemical specific ARARs because COCs will remain in place.

Alternatives 2 and 3 offer an equivalent degree of ARAR compliance, as they both will address COCs exceeding site-specific RGOs and will be implemented in accordance with action- and location-specific ARARs.

***Long-Term Effectiveness and Permanence***

Alternative 3 provides the greatest long-term effectiveness, because contaminated surface and subsurface soils will be removed from the site, resulting in the greatest contaminant mass removal of the three alternatives. Alternative 3 removes soil at all depths from the site that exceed both the industrial and construction worker risk-based RGOs. Alternative 2 removes soil only from the surface that exceeds the calculated industrial RGO (and establishes a protective control for the construction work scenario); therefore, Alternative 2 requires a greater degree of maintenance, monitoring, and oversight to ensure that future workers and ecological receptors are not exposed to impacted soil at depth (though the vegetated soil cover can be replaced with pavement or structures as development dictates).

***Reduction of Toxicity, Mobility, or Volume Through Treatment***

None of the alternatives reduce the volume of COCs in residual soils at the site; however, both Alternatives 2 and 3 assume that 10 percent of excavated soil will be treated to stabilize lead prior to disposal to reduce mobility and toxicity. Alternative 3 provides the greatest reduction in mobility and volume of COCs because

Alternative 3 entails a total excavation volume of 38,000 CY, based on the following:

- Excavation and disposal of an anticipated 31,000 CY of impacted soil to achieve residual soil concentrations with a 95% upper confidence limit below site-specific risk-based RGOs. Alternative 3 also incorporates an additional 7,000 CY of soil removal for bulk lead removal.

Alternative 2 entails the excavation and disposal of approximately 21,000 CY of impacted soil, thus providing less volume reduction of COCs on site.

***Short-Term Effectiveness***

Alternatives 2 and 3 are generally effective in the short term. However, Alternative 2 offers the greatest short-term effectiveness, as the lesser depth of excavation allows for a more rapid implementation of the remedial alternative when compared to the more intrusive Alternative 3. Alternative 2 minimizes:

- Necessary logistical coordination with the U.S. AF
- The engineering design required (e.g., utility protection, building foundation protection, requirements for excavation competent person monitoring)
- The quantity of post-excavation confirmation samples required because excavation floor samples will not be required
- The double handling of soils because shallower soils are generally easier to excavate and load out.

***Implementability***

Alternatives 2 and 3 are both technically and administratively feasible.

***Cost***

A comparison of the costs for the remedial alternatives is provided in **Table 6**. Total capital costs, total present worth of annual operation and maintenance costs, and total present worth for each alternative is presented. Capital costs are divided into direct costs for construction and indirect costs for non-construction and overhead. Direct capital costs include construction, equipment, relocation, disposal, and land and site development costs. Indirect capital costs include engineering expenses, legal fees, license or permit costs, start-up costs, and contingency allowances. Operation and maintenance costs are associated with post-construction activities necessary to properly operate, maintain, and monitor a given response action. Costs incurred throughout the project were assumed at an annual escalation rate of 3 percent. Based on the present worth cost estimates for the alternatives, Alternative 3 is the costliest ($11,262,000), as it entails the largest excavation and disposal of soil. Alternative 2 is less costly ($8,819,000) because it is limited in the scope of excavation.

***Summary of Comparative Analysis***

Alternative 1 did not meet either of the threshold criteria; therefore, it was not evaluated with the balancing criteria. Alternatives 2 and 3 effectively meet the statutory requirements of CERCLA Section 121 by satisfying both threshold and primary balancing criteria. Alternatives 2 and 3 are protective of human health; however, Alternative 3 provides greater protection for the environment and complies with ARARs.

These two remaining alternatives provide adequate long-term effectiveness by mitigating risks posed by waste and impacted soil because they reduce the potential for direct contact and surface erosion. Alternative 3 provides the greatest long-term effectiveness because both contaminated surface and subsurface soils will be removed from the site, resulting in the largest contaminant mass removal.

Although there will be no reduction of toxicity, mobility, or volume through treatment for any of the alternatives, both Alternatives 2 and 3 assume that 10 percent of excavated soil will be treated to stabilize lead prior to disposal to reduce mobility and toxicity. Alternative 3 will be

the most effective because the toxicity and potential for mobility of COCs are minimized by removing more impacted material.

The short-term effectiveness for each alternative will be achieved by the amount of time required to implement the alternative. Alternative 2 will be the shortest to implement based on the labor, materials, and resources required for construction. Alternative 3 will take more time to complete due to the more intrusive nature of the excavation and larger excavation volume.

Alternatives 2 and 3 are both technically and administratively feasible because they use standard construction and methods.

Alternative 3 is the costliest because it includes excavation and disposal of the greatest volume of soil. Alternative 2 is less costly because it is limited in the scope of excavation, and therefore, requires lower capital costs.

In summary, Alternative 3 provides greater long-term benefits (permanence) and protectiveness to human health and the environment compared to the other evaluated remedial alternatives.

## 10. Summary of the Preferred Alternative

**Alternative 3 – Surface and Subsurface Soil Removal Action to Address Industrial Worker Risk, Construction Worker Risk, and Lead Mass Removal Optimization**, is the Preferred Alternative. This alternative is implementable; effective in meeting the RAOs and mitigating and controlling risks at the site; results in the reduction of the volume and mobility of waste on site; and is reasonable with respect to present worth cost. Furthermore, Alternative 3 eliminates the risks and costs associated with soil handling and management during future site development. The risk assessment conducted for the 2017 RI/FFS determined that there are no unacceptable risks associated with exposure to groundwater, surface water, sediment, or stormwater. ARARs associated with the Preferred Alternative are included Section 8.2 of the RI/FFS.

Alternative 3 includes the excavation, transport, and off-site disposal of both surface and subsurface soil to prevent direct contact with COCs. Soil will be targeted for removal to achieve a 95% upper confidence limit residual soil concentration below site-specific risk based RGOs. Alternative 3 assumes that construction workers have the potential to be exposed to subsurface soil (e.g., utility trenching, building foundation excavation). Therefore, excavation, transport, and disposal of soil to depth (where subsurface concentrations exceed remedial goals for COCs) will mitigate the risk/hazard posed by impacted soil to the industrial and construction worker. Alternative 3 also includes (1) excavation of soil with visible lead shot and (2) optimization of lead shot removal based on a spatial evaluation of shot density in soil. This evaluation allows for maximizing lead mass reduction while minimizing the amount of additional excavation volume. **Figure 5** depicts the approximate excavation area proposed for Alternative 3.

The major components of Alternative 3 consist of the following:

- Site preparation, installation of erosion and sediment controls, vegetation clearing, and establishment of site controls
- Excavation, stabilization (as necessary), transportation, and disposal of approximately 31,000 CY of soil
- Excavation, stabilization (as necessary), transportation, and disposal of an additional 7,000 CY of soil based on optimizing lead mass removal to approximately 90%
- Collection of waste characterization samples to document that the 95% upper confidence limit of residual soil concentrations remain below site-specific risk-based RGOs
- Collection of confirmation samples
- Import and placement of tested clean common borrow within the excavations to match the existing grade appropriate to support native vegetation

- Site restoration following construction
- Implementation of LUCs/LTM.

In summary, Alternative 3 controls the risks/hazards associated with all reasonably anticipated current and future use of the site via excavation and off-site disposal of soil containing COCs that result in a 95% upper confidence limit concentration greater than the site-specific risk-based RGOs by decision unit. Although Alternative 3 mitigates all site risks/hazards for the reasonably anticipated uses of the site, COCs will continue to remain at the site at concentrations that do not allow unrestricted use. Therefore, LUCs and LTM will be implemented.

Following completion of construction activities, a Remedial Action Completion Report (RACR) will be prepared to document remedy implementation. The RACR will include a confirmatory ecological evaluation to verify remedial objectives are met. The data set used in this evaluation will include soil data representative of the remaining soil left on site following completion of the excavation as well as new data from sampling and analysis of clean backfill imported to the site to demonstrate representative concentrations for each exposure area to meet remedial objectives. Post-excavation confirmation samples will be collected at a sufficient quantity and quality to adequately perform an ecological evaluation. Details regarding the sampling and evaluation will be outlined in the Remedial Design and/or Remedial Action Work Plan.

Two rounds of groundwater/surface water sampling will also be conducted following remedy implementation to document current site conditions. Groundwater sampling will be limited to monitoring wells that have exhibited concentrations of inorganics in exceedance of their respective U.S. EPA MCLs or Florida groundwater CTLs. Similarly, surface water sampling will be limited to locations that have exhibited concentrations of inorganics in exceedance of their respective Florida surface water CTLs. While no unacceptable CERCLA risks were identified in the RI/FS as a result of exposure to groundwater or surface water, LUCS will be employed to mitigate exposure to impacted groundwater/surface water where concentrations exceed applicable screening criteria. It should be noted that wells within the footprint of the proposed excavation will be abandoned as a component of the Preferred Remedy and will not be reinstalled. Sampling results will be presented in a standalone document separate from the RACR.

Details pertaining to the confirmatory ecological evaluation and groundwater/surface water sampling events will be presented in the Remedial Design/Remedial Action Work Plan.

## 11. Community Participation

The U.S. AF, the U.S. EPA, and the FDEP encourage the public to review this Proposed Plan and other relevant documents in the administrative record file to gain an understanding of FR038 and the proposed cleanup actions. A copy of this Proposed Plan, as well as the entire administrative record file, is located in the Tyndall AFB Library, 640 Suwanee Road, Tyndall AFB, Florida, and at the Bay County Public Library, 898 West 11th Street, Panama City, Florida.

The Proposed Plan and the contents of the administrative file may be accessed during normal operation hours at the Bay County and Tyndall AFB libraries. An electronic copy of the file is also available at the Bay County Public Library.

The U.S. AF will comply with provisions of NCP §300.430(f)(3)(i) by publishing a notice of availability and a brief description of the Proposed Plan in the Panama City News Herald.

## REFERENCES

40 CFR §300.430(e)(6). National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

AECOM. 2012a. Final Remedial Investigation/Feasibility Study Work Plan ERP Site ID FR038 (OU 15) Beacon Beach Skeet Range, Tyndall Air Force Base, Florida. Revision 1. April.

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U.S. EPA. 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. July.

U.S. EPA. 2000. A Guide to Developing and Documenting Cost Estimates during the Feasibility Study. July.

## GLOSSARY

Specialized terms used elsewhere in the Proposed Plan are defined below.

**Administrative Record -** The official records containing all public information regarding the site. A copy of the administrative record is maintained at the Tyndall AFB Library and the Bay County Public Library.

**Applicable or Relevant and Appropriate Requirements (ARARs)** – The federal and state requirements that a selected remedy must meet. These requirements may vary among sites, COCs, and remedial alternatives considered.

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** – The federal law that addresses problems resulting from releases of hazardous substances to the environment, primarily at inactive sites. Also known as Superfund.

**Focused Feasibility Study (FFS)**. An investigation conducted under CERCLA in which remedial alternatives are developed, considered, and evaluated for remedial actions.

**National Oil and Hazardous Substances Pollution Contingency Plan (NCP)** – The regulation that implements CERCLA. Among other things, the NCP establishes the overall approach for determining appropriate remedial actions at Superfund sites.

**Preferred Alternative** – The remediation approach that appears to best meet acceptance criteria; the remedial option proposed for implementation in the ROD.

**Proposed Plan -** A document that presents a proposed cleanup alternative, rationale for the preference, and requests public input regarding the proposed alternative.

**Remedial Action Objective (RAO) -** RAOs are site-specific, initial cleanup objectives that are established on the basis of the nature and extent of contamination, the resources that are currently and potentially threatened, and the potential for human and environmental exposure.

**Record of Decision (ROD)** – A document that specifies the remedy that must be implemented for a site.

**Remedial Investigation (RI)** - An investigation conducted under CERCLA in which data are collected to determine COCs at a site and the affected media. These data are used in a feasibility study to establish appropriate remedial actions for the site.

**Total Present Worth** - Represents the life-cycle cost of an Alternative. The total present worth condenses all the costs that are expected to occur within the project lifetime into a single lump sum in current dollars, with future expenses discounted back to current dollars using a specified discount rate.

## ACRONYMS

| | |
|---|---|
| µg/dL | microgram per deciliter |
| µg/L | microgram per liter |
| AFB | Air Force Base |
| AFHQ | First Air Force Headquarters |
| ARAR | applicable or relevant and appropriate requirement |
| BaP | benzo(a)pyrene |
| BaP TEQ | benzo(a)pyrene toxic equivalent concentration |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| CFR | Code of Federal Regulations |
| COC | constituent of concern |
| COPC | constituent of potential concern |
| COPEC | constituent of potential ecological concern |
| CTL | cleanup target level |
| CY | cubic yards |
| EE/CA | engineering analysis/cost analysis |
| ERA | ecological risk assessment |
| FAC | Florida Administrative Code |
| FFA | Federal Facility Agreement |
| FDEP | Florida Department of Environmental Protection |
| FR038 | Beacon Beach Skeet Range |
| GRA | general response action |
| HHRA | human health risk assessment |
| HPAH | high molecular weight polycyclic aromatic hydrocarbons |
| HI | hazard index |
| HQ | hazard quotient |
| IEUBK | integrated exposure uptake biokinetic |
| ILCR | incremental lifetime cancer risks |
| LOAEL | lowest observable adverse effect level |
| LPAH | Low molecular weight polycyclic aromatic hydrocarbons |
| LTM | long-term maintenance |
| LUC | land use control |
| MCL | maximum contaminant level |
| mg/kg | milligram/kilogram |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NTCRA | non-time-critical removal action |
| PA | preliminary assessment |
| PAH | polycyclic aromatic hydrocarbon |
| RACR | Remedial Action Completion Report |
| RAO | remedial action objective |
| RCRA | Resource Conservation and Recovery Act of 1976 |
| RGO | remedial goal option |
| RI/FFS | Remedial Investigation/Focused Feasibility Study |
| ROD | record of decision |

| | |
|---|---|
| RSL | regional screening level |
| SARA | Superfund Amendments and Reauthorization Act of 1986 |
| SF | square foot |
| SI | site inspection |
| U.S. AF | United States Air Force |
| U.S. EPA | United States Environmental Protection Agency |

# APPENDIX A

3/3/2016

## Benzo(a)pyrene Conversion Table

For Direct Exposure Soil Cleanup Target Levels

Facility/Site Name: _____
Location: _____
Facility/Site ID No.: _____

Soil Sample No. _____
Sample Date _____
Location: _____
Depth (ft): _____

INSTRUCTIONS: Calculate Total Benzo(a)pyrene Equivalents if at least one of the carcinogenic PAHs is detected in the sample at a concentration equal to or higher than the Method Detection Limit (MDL), whether quantified with certainty (the concentration reported has no qualifier) or estimated (the concentration reported has a "J", "T" or "I" qualifier). Enter the contaminant concentrations (in mg/kg) for all seven carcinogenic PAHs in the yellow boxes using the following criteria (and see table below):

1. If quantified with certainty, or estimated and has the "J" qualifier, enter the reported value;
2. If not detected at the MDL (the concentration reported is the MDL followed by the "U" qualifier) enter 1/2 of the reported value;
3. If detected at a concentration lower than the MDL and the concentration is estimated (has the "T" qualifier) enter the estimated value;
4. If detected at a concentration equal to or higher than the MDL but lower than the Practical Quantitation Limit (PQL) and the concentration is estimated (has the "I" qualifier) enter the estimated value;
5. If detected at a concentration equal to or higher than the MDL but lower than the PQL and it is not estimated (the concentration reported is the PQL followed by the "M" qualifier) enter 1/2 of the reported value.

| Contaminant | Concentration (mg/kg) | Toxic Equivalency Factor | Benzo(a)pyrene Equivalents |
|---|---|---|---|
| Benzo(a)pyrene | 0.000 | 1.0 | 0.0000 |
| Benzo(a)anthracene | 0.000 | 0.1 | 0.0000 |
| Benzo(b)fluoranthene | 0.000 | 0.1 | 0.0000 |
| Benzo(k)fluoranthene | 0.000 | 0.01 | 0.0000 |
| Chrysene | 0.000 | 0.001 | 0.0000 |
| Dibenz(a,h)anthracene | 0.000 | 1.0 | 0.0000 |
| Indeno(1,2,3-cd)pyrene | 0.000 | 0.1 | 0.0000 |

DE Residential = 0.1 mg/kg; DE Industrial = 0.7 mg/kg

**Total Benzo(a)pyrene Equivalents =** **0.0**

The concentration shown does not exceed the Residential Direct Exposure SCTL of 0.1 mg/kg.

The concentration shown does not exceed the Industrial Direct Exposure SCTL of 0.7 mg/kg.

| Summary Criteria for Table Entries | | | |
|---|---|---|---|
| **Detection** | **Concentration Reported** | **Data Qualifier** | **Enter** |
| Various | Quantified with certainty | None | reported value |
| Various | Estimated | J | reported (estimated) value |
| ND at MDL | MDL | U | 1/2 reported value |
| < MDL | Estimated | T | reported (estimated) value |
| ≥ MDL but < PQL | Estimated | I | reported (estimated) value |
| ≥ MDL but < PQL | PQL | M | 1/2 reported value |

**FROM:**

Name:

Address:

Affiliation:

Phone:

Place USPS Stamp Here

**TO:**

Tyndall Air Force Base
AFCEC/CZO Bld 421, Stop 42
119 Alabama Avenue
Tyndall AFB, Florida 32403-5014
**Attn: Mr. Joseph McLernan**
Restoration Manager

FOLD HERE

FROM:
Name:

Address:

Affiliation:

Phone:

**TO:**
Tyndall Air Force Base
AFCEC/CZO Bld 421, Stop 42
119 Alabama Avenue
Tyndall AFB, Florida 32403-5014
**Attn: Mr. Joseph McLernan**
Restoration Manager

Please print or type comments here: